

Aeronautics Committee Report to the NASA Advisory Council

Ms. Marion Blakey (Chair)

Dr. Ilan Kroo (Member)

August 4, 2011



Committee Information



Members:

- Ms. Marion Blakey (Chair)
- Dr. Ilan Kroo*
- Dr. Mark Lewis
- Mr. Preston Henne
- Dr. R. John Hansman*
- Mr. Mark Anderson
- Dr. Harry McDonald *
- Mr. Paul Adams*
- Dr. John Langford*
- Mr. John Borghese*
- Dr. Ray Colladay (ex-officio)

Next face-to-face
committee meeting at
NASA headquarters,
October 13-14, 2011

*In attendance at meeting

Topics of Discussion



Source: Boeing



- Aeronautics Research Mission Directorate (ARMD)
International Engagement Strategy*
- Verification and Validation for Flight Critical Systems*
- Systems Analysis and Strategic Planning*

* This topic has a related finding or observation provided by the Aeronautics Committee



Global aeronautics environment is changing...

- European aeronautics research and development funding has become more coordinated and focused
- Non-traditional NASA ARMD partners (Brazil, Russia, India, China) will play important roles in future aviation research
- Other countries (Canada, Japan, Korea, Singapore, and others) are making aviation a national priority

ARMD is evolving a more proactive international strategy that will:

- Seek collaborations important to NASA and national aeronautics goals
- Foster global information exchange through International Forum for Aviation Research in air traffic management, safety, environmental impact.
- ARMD will continue working with government organizations (such as NLR, DLR, ONERA, JAXA) for bi-lateral or multi-lateral agreements

International Collaboration: Opportunities



4D trajectory, high-fidelity airport environmental modeling at ONERA

Concentration of highly equipped oceanic fleet and test bed with NLR, KLM, LVNL, Schiphol

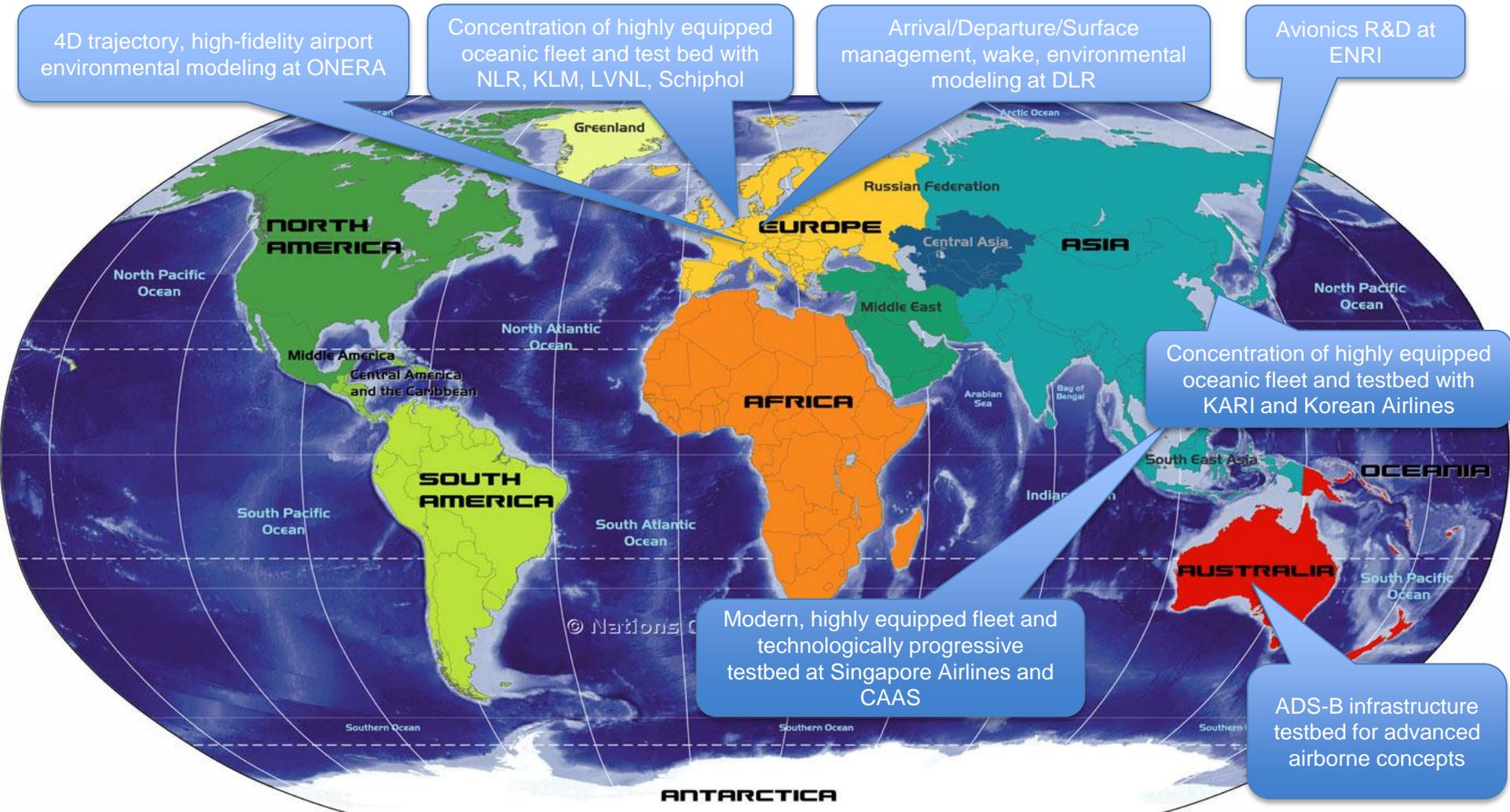
Arrival/Departure/Surface management, wake, environmental modeling at DLR

Avionics R&D at ENRI

Concentration of highly equipped oceanic fleet and testbed with KARI and Korean Airlines

Modern, highly equipped fleet and technologically progressive testbed at Singapore Airlines and CAAS

ADS-B infrastructure testbed for advanced airborne concepts





- The committee encourages ARMD's efforts to establish deeper collaborations with the international community. The US needs to understand what is happening in the rest of the world, including capabilities of emerging economies – proactive intelligence.
- Need to understand competitive issues but work together strategically and in those areas of mutual benefit (e.g. ATM inter-operability, understanding high ice-water content weather phenomenon).

Verification and Validation for Flight Critical Systems (VVFCS)

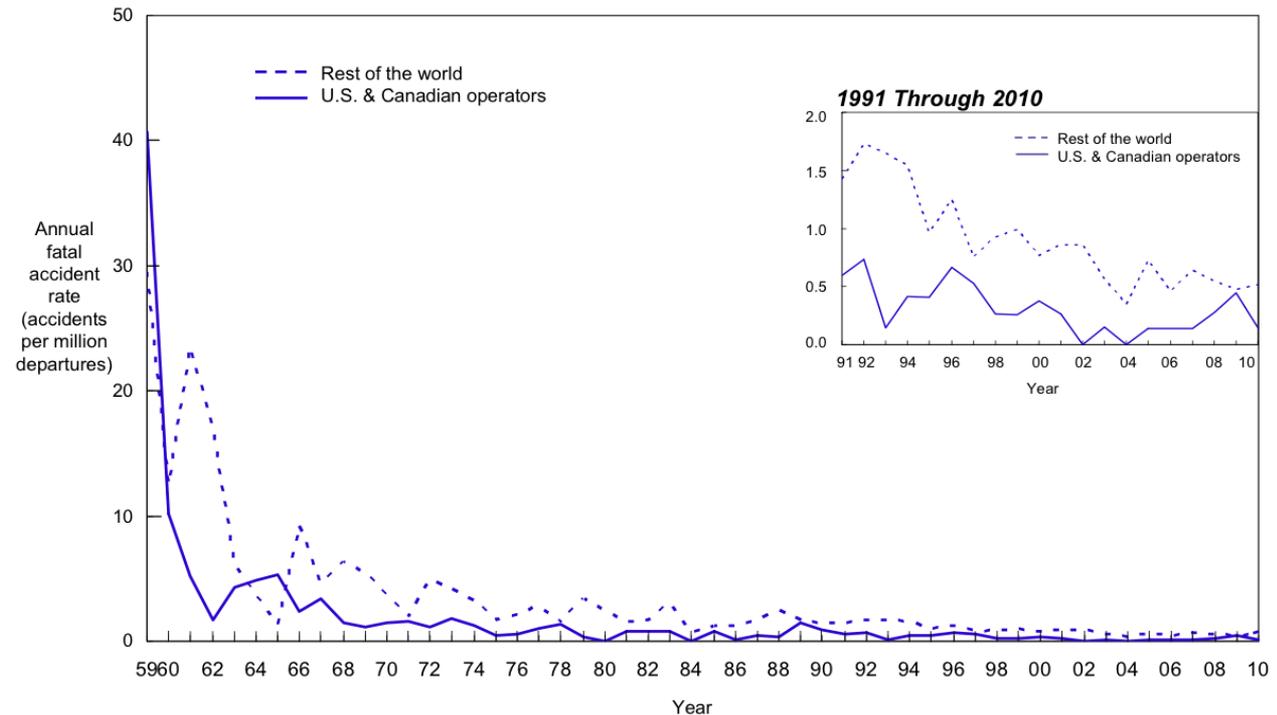


Provide tools and techniques to ensure safe and rapid deployment of NextGen technologies

Enable safe and rapid development of complex systems that:

- are at least as safe as the current system
- have a cost-effective basis for certification

U.S. and Canadian Operators Accident Rates by Year Fatal Accidents – Worldwide Commercial Jet Fleet – 1959 Through 2010



Statistical Summary of Commercial Jet Airplane Accidents Worldwide Operations
(<http://www.boeing.com/news/techissues/pdf/statsum.pdf>)

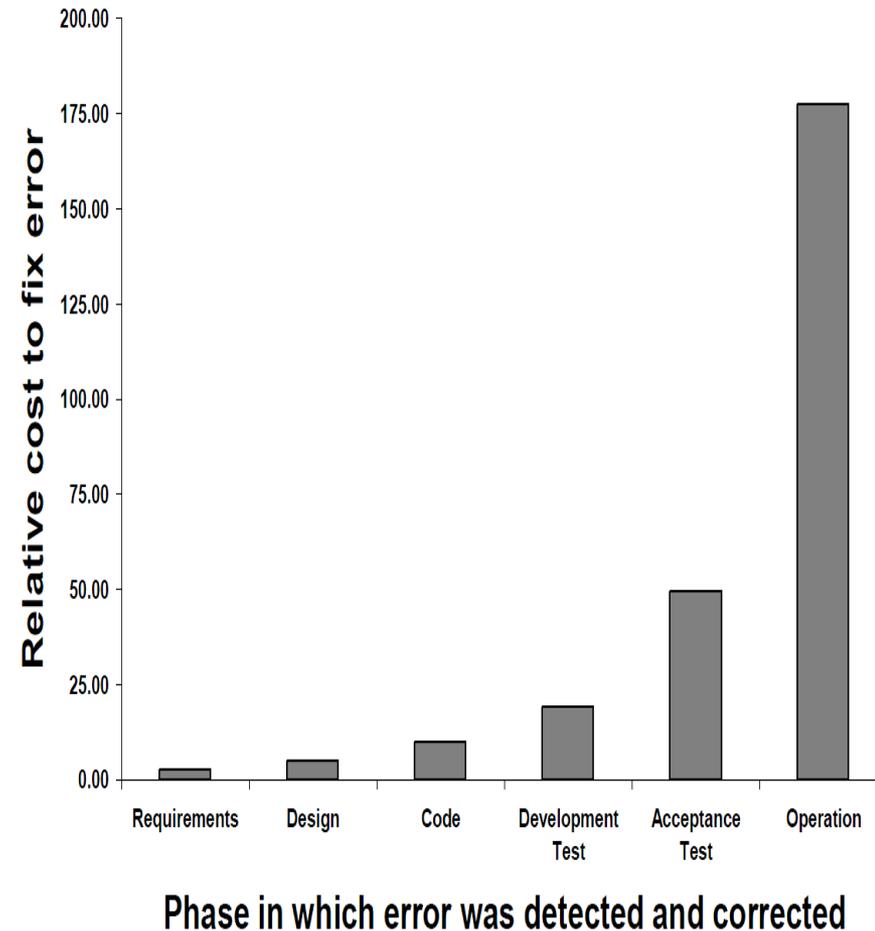
Verification and Validation for Flight Critical Systems



Develop cost-effective techniques for verification and validation of complex civil aviation systems unifying processes for ground-based and airborne systems

Benefits:

- Rapid but safe incorporation of technological advances in avionics, software, automation, and aircraft and airspace concepts of operation
- Availability of safety assurance methods enabling manufacturers and users to exploit latest technological advances and operational concepts

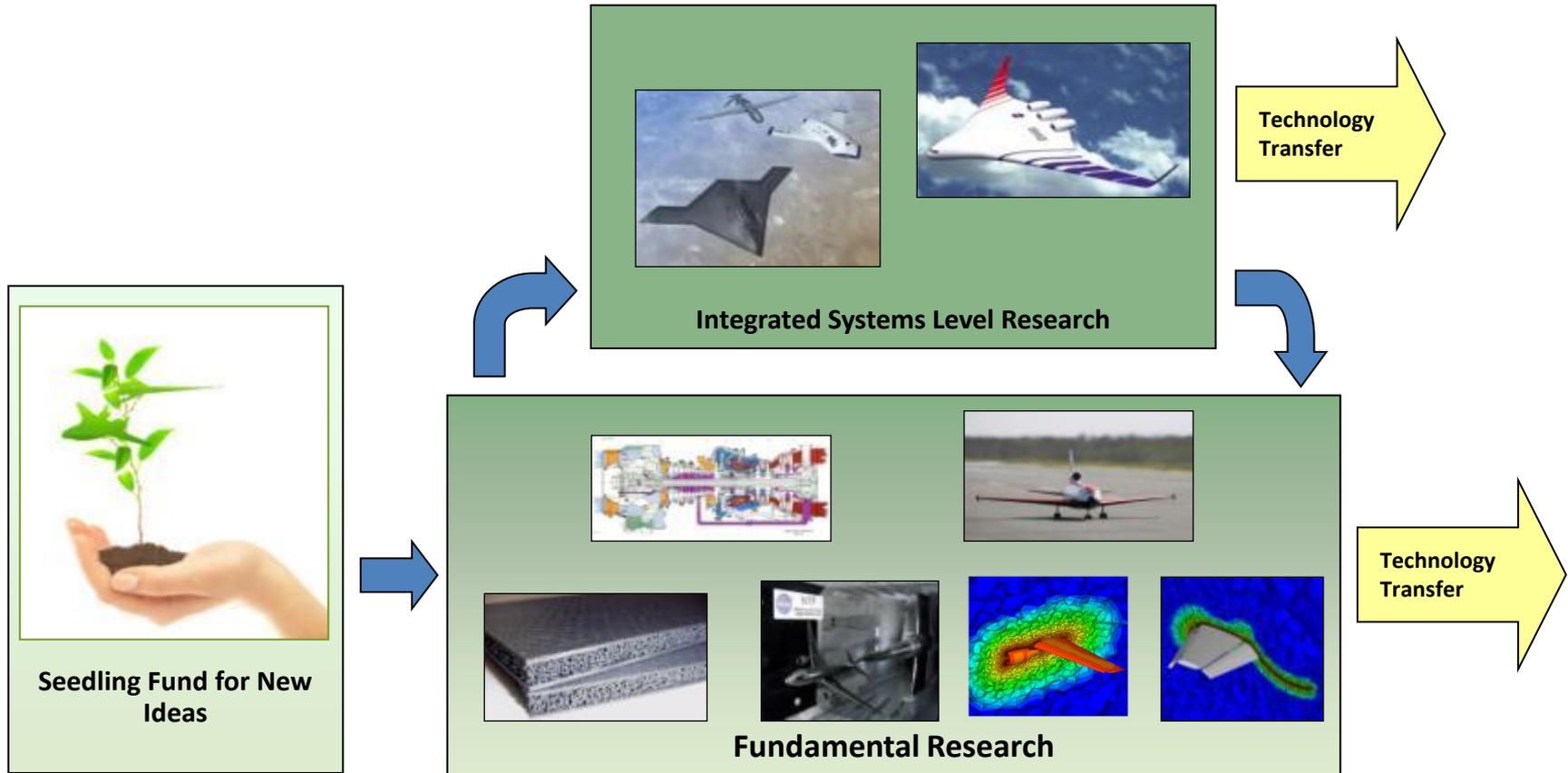


Boeing 787 software cost ~\$4.5B ⁹



- Research in verification and validation is a critical national need and this is an important area of work for NASA.
- The work needs to be clearly connected with applications -- e.g. how will a new approach help in certification?
- This is a very challenging problem and it is important to show incremental progress along with ideas for more comprehensive solutions.

Aeronautics Overall R&D Strategy



- Foster revolutionary ideas with seedling fund
- More robust technology transfer to industry and other government agencies through innovative fundamental research and further maturation of technologies and concepts in system level research
- Conduct integrated systems research in relevant environments (e.g., flights, full simulations) to realize next set of technological breakthroughs and inspire next generation



Connect ARMD Goals and Technology Challenges to:

- NASA Strategic Plan
 - National Aeronautics Research and Development Plan
 - NextGen Planning documents
 - NRC Decadal Survey, NIA Aviation Plan for American Leadership
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- Review and recommend changes to the ARMD portfolio
 - Develop a system-level research agenda
 - Publish an ARMD Strategic Implementation Plan



Purpose: To provide a forum for discussion of national needs and system-level research opportunities in aeronautics

- First meeting scheduled for August 25, 2011 at the National Academies' Keck Center in Washington DC
- Chaired by John Tracy, Chief Technology Officer, Boeing
- Representatives from academia, industry, and other federal agencies



- It is important to capture the results of systems analyses and trade studies/sensitivity analysis.
- This can be used to help defend and prioritize ARMD's research and to build advocacy.
- Dissemination of results internally and externally can be done in several ways, including conventional publication with knowledgeable summaries and accessible databases with more detailed information.
- NASA's aeronautics program is pursuing these approaches.